

## **CLIPPED DECORATIVE STRUCTURE**

### **CROSS REFERENCE TO RELATED APPLICATIONS**

**[0001]** This application claims the benefit of international application serial no. PCT/US02/22945, filed on July 19, 2002, designating the United States and published in English, which claims the benefit under 35 U.S.C. §119(e) of U.S. provisional patent application serial no. 60/306,516, filed on July 19, 2001.

### **BACKGROUND**

**[0002]** The present invention relates generally to ceiling fixtures and, more particularly, to ceiling fixtures for suspension from a hard ceiling in an open plenum space.

**[0003]** Traditional suspended ceiling structures formed from suspended grids of acoustically absorbent tiles are commonly found in commercial workspaces such as professional offices. While such structures provide a pleasant and acoustically absorbent space, designers and architects who desire to create the feel of an open loft space often object to the uniformity and lowered ceiling height created by conventional drop ceilings. Thus, more and more businesses are opting for so-called open plenum ceiling designs. In the open plenum, no suspended ceiling is provided that screens the entire hard deck or hard ceiling along with the HVAC duct work, wiring and the like. Rather, these structural elements are exposed. Open plenum ceilings are more commonly found in retail stores and similar commercial settings, but also can be found in office spaces.

[0004] In office spaces where open plenum ceilings are found, individual offices within the office space often are created using reconfigurable partitions that may be considerably lower than the hard ceiling. Whether in an office space or some other in-door space, the combination of an open plenum design with partitions that do not rise to the ceiling hard deck tends to leave the space unstructured and, consequently, less useful and aesthetically pleasing than it might otherwise be with some decorative structure that helps to define and differentiate the space.

[0005] To differentiate a space and to create a more interesting visual in a loft style space or open plenum design, architects sometimes will specify that an open loft space be provided with customized decorative structures suspended from the ceiling to differentiate the space within the room. Such suspended decorative structures not only can delineate the space but also may dampen extraneous noise and create an interesting visual. Unfortunately, such decorative structures must be preformed into the desired shape, thus making them difficult to ship or mass produce. Consequently, such decorative structures tend to be made only as customized pieces. Such customization leads to considerable expense to fabricate such a suspended decorative structure and its framing.

[0006] Therefore, there is a need for a decorative structure that can be suspended within a space and that is structured such that its elements can be easily interchanged to provide a variety of configurations with basic elements some of which, at least, may be mass produced.

## SUMMARY

[0007] The present invention provides a decorative structure including a panel connected to a support structure suspended in a given space. The panel may be fastened to the support structure by a clip. The decorative structure may be configured in a variety of conformations to provide the desired visual impact. The panel may be flexible and maintained in a flexed configuration

within the decorative structure by the support structure. The panel may be formed from a variety of materials such as fabric, wood, paper, metal, glass or plastic.

**[0008]** In one embodiment, the decorative structure comprises a panel having first and second faces. A support structure is aligned adjacent the second face of the panel and is fastened to the panel by a clip that extends along a portion of the first face of the panel. The clip may include a major leg and a minor leg connected by a convolute retainer that extends along the first face of the panel. The support structure may include a first member that has a keyed aperture in which is disposed a first cross member that intersects the first member. A second cross member may also be disposed in the keyed aperture and be interconnected with the first cross member. An intersection clip may be provided that engages the intersecting members. The intersection clip may include two achiral halves and one or more convolute saddle members.

**[0009]** The present invention also encompasses a decorative structure having a panel connected to a support structure that includes a first member with a keyed aperture and a first cross member disposed in the keyed aperture. The first member and first cross members may again be fastened together by an intersection clip that engages both the first member and the first cross member. The decorative structure may also include a second cross member interconnected with the first cross member and disposed in the keyed aperture.

**[0010]** These and other features of the present invention will become apparent upon reading the following detailed description, when taken in conjunction with the accompanying drawings that are briefly described as follows.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

**[0011]** Fig. 1 is a perspective view of a decorative structure embodying principles of the present invention.

**[0012]** Fig. 2 is a perspective view of an alternative configuration of the decorative structure of Fig. 1.

**[0013]** Fig. 3 is a perspective view of another decorative structure embodying principles of the present invention.

**[0014]** Fig. 4 is a perspective view of a further decorative structure embodying principles of the present invention.

**[0015]** Fig. 5 is a perspective view of a portion of a decorative structure embodying principles of the present invention.

**[0016]** Fig. 6 is a perspective view of a portion of a support structure embodying principles of the present invention.

**[0017]** Fig. 7 is a perspective view of a portion of a support structure embodying principles of the present invention during assembly.

**[0018]** Fig. 8 is a perspective view of the portion of the support structure of Fig. 7 at another point in the assembly process.

**[0019]** Fig. 9 is a perspective view of the portion of the support structure of Fig. 7 at yet another point in the assembly process.

**[0020]** Fig. 10 is a perspective view of a clip embodying principles of the present invention.

**[0021]** Fig. 11 is another perspective view of the clip of Fig. 10.

**[0022]** Fig. 12 is a perspective view of an intersection clip embodying principles of the present invention.

**[0023]** Fig. 13 is a perspective view of the intersection clip of Fig. 12 rotated 180 degrees.

**[0024]** Fig. 14a is a perspective view of a first member of a support structure embodying principles of the present invention.

**[0025]** Fig. 14b is a perspective view of another first member of a support structure embodying principles of the present invention.

**[0026]** Fig. 15 is a side view of a further first member of a support structure embodying principles of the present invention.

**[0027]** Fig. 16 is a side view of yet another first member of a support structure embodying principles of the present invention.

**[0028]** Fig. 17a is a perspective view of a cross member of a support structure of the present invention.

**[0029]** Fig. 17b is a perspective view of another embodiment of a cross member of a support structure of the present invention.

**[0030]** Fig. 18 is a side view of still a further embodiment of a cross member of a support structure of the present invention.

**[0031]** Fig. 19 is a side view of yet another embodiment of a cross member of a support structure of the present invention.

**[0032]** Fig. 20 is a side view of a pair of major end caps of a support structure embodying principles of the present invention.

**[0033]** Fig. 21 is a side view of a pair of minor end caps of a support structure embodying principles of the present invention.

## DETAILED DESCRIPTION

[0034] Referring now in greater detail to the figures, wherein like numerals refer to like parts throughout the drawings, the present invention generally includes a decorative structure comprising a panel connected to a support structure by a clip. The decorative structure provides a differentiating visual element to a space in which it is suspended. The decorative structure may be easily installed and reconfigured to suit the user and the space in which it is suspended. The elements of the decorative structure may be interchanged in order to provide different visual and aesthetic impact. The panel may be provided in a variety of shapes, materials and finishes. For example, the panel may be formed of wood, paper, metal, plastic, glass or any other suitable material. The panel may be a monolithic structure or comprised of interconnected elements and it may be solid, mesh or include a variety of decorative designs or openings therein to provide the desired visual impact.

[0035] The decorative structure 100 shown in Fig. 1 includes a panel 30 having a first face 31 and a second face 32. A support structure 44 is aligned adjacent to the second face of panel 30. The panel 30 is fastened to the support structure by one or more clips 70. Clip 70 engages a portion of support structure 44 and extends along a portion of the first face 31 of panel 30. The support structure 44 includes a first member 40 having a keyed aperture 42 formed therein. First members 40 are intersected by first cross members 50, which are disposed and/or extend through keyed apertures 42. A second cross member 52 may also be disposed within keyed aperture 42 and interconnect with first cross member 50. Alternatively, an end cap 80 may be disposed within the keyed aperture 42 and interconnect with first cross member 50 or second cross member 52. The support structure 44 generally includes a grid of intersecting members that are frictionally interlocked. Each intersection of members and cross members also includes an

intersection clip 60 disposed on either end of the intersecting members. More particularly, one intersection clip 60 may be disposed on the side of intersecting members 50, 52 and 80 adjacent the second face 32 of panel 30 and a second intersection clip may be oppositely disposed the first intersection clip on the opposing side of the intersecting members 50, 52 and 80. The intersecting clips 60 fasten the cross members together and maintain the intersecting alignment of the cross members. As shown in Figs. 1 and 2, first members 40 may be curved so that the final decorative structure 100 has the panel 30 maintained in a flexed configuration. Furthermore, Figs. 1 and 2 illustrate two of the various possible configurations of the decorative structure 100 of the present invention. The support structure 44 may be generally disposed above the panel 30, as shown in Fig. 1, or the support structure 44 may be generally disposed below panel 30, as shown in Fig. 2. The present invention encompasses all possible configurations of the decorative structures illustrated in the drawings.

[0036] Figs. 3 and 4 illustrate further embodiments of the decorative structures 300 and 400 encompassed by the present invention. Fig. 3 illustrates a decorative structure 300 having a curved section and a generally flat section. Panel 330 may be flexed by its attachment to support structure 344 and maintained in such a configuration. Fig. 3 also illustrates that a combination of curved members 340a and straight members 340b may be combined within the same decorative structure to provide a variety of configurations for the overall decorative structure. Likewise, Fig. 4 illustrates a more simplified version of the decorative structure 400 of the present invention in which panel 430 is maintained in a generally flat configuration via its attachment to support structure 444 which includes only straight members 440, cross members 450 and end caps 460. For decorative structures similar to those shown in Figs. 1-4, a support structure may be constructed using simply members having keyed apertures in which are disposed cross

members that interconnect with each other and clips that secure the intersections and connect the panels to the support structures.

**[0037]** Figs. 5 and 6 illustrate a typical interconnection of components of a decorative structure of the present invention. Support structure 44 is aligned adjacent to the second face 32 of panel 30. Clip 70 engages support structure 44 and fastens panel 30 thereto. More particularly, the major leg 74 of clip 70 engages first member 40 and extends down to form convoluted retainer 76 which wraps around the edge 35 of panel 30 and extends along a portion of the first face 31 of panel 30. Convoluted retainer 76 extends to form minor leg 72, which engages the opposing face of first member 40. First cross member 50 is disposed within keyed aperture 42 formed in first member 40. Second cross member 52 is also disposed in keyed aperture 42 and interconnects with first cross member 50, thereby forming an intersection within the support structure 44. Two intersection clips 60 are disposed on either end of the intersections. Each intersection clip 60 includes two convolute saddles that wrap around first cross member 50 and second cross member 52. The intersection clips also engage first member 40 so as to maintain each of these members in position in the intersection. In this manner, the separate parts of the structure are interconnected and maintained in the desired configuration.

**[0038]** As shown in Figs. 7-9, first cross member 50 is inserted into keyed aperture 42 at an angle so as to extend through the major channel 43 of the keyed aperture 42. First member 50 is then rotated, as shown in Fig. 8, so that it is secured in the minor channel 45 of keyed aperture 42. Intersecting clips 60 are then inserted over and under the intersecting members so as to engage and secure each member in the intersection.

**[0039]** As shown in Figs. 10 and 11, the clip 70 may be formed of a single convoluted wire, which may be formed of a suitable material, such as metal or plastic. The clip 70 generally



includes a major leg 74 and a minor leg 72 connected by a convolute retainer 76. As discussed above, minor and major legs 72 and 74 engage a portion of the support structure 44 of the decorative structure in order to fasten a panel 30 to the support structure 44. The engagement of the support structure 44 by the minor and major legs 72 and 74 may be simply frictional in nature or may be accomplished by the insertion of major post 75 and minor post 73 into apertures formed in first member 40. Convolute retainer 76 is generally formed to extend over the edge of a panel 30 and along a portion of a face of the panel opposite that adjacent to the support structure 44.

[0040] Figs. 12 and 13 illustrate an embodiment of intersection clip 60 that generally includes two achiral halves 61a and 61b. One half may extend over or under first cross member 50 which the second half may extend over or under second cross member 52 depending upon whether the intersection clip is positioned above or below the intersecting members. Generally, the intersection clip 60 will be aligned on top of intersecting members as shown in Fig. 12, while it will be aligned on the bottom of intersecting members as shown in Fig. 13. Each achiral half 61a and 61b generally includes a convolute saddle formed of bent members 62 and 64. The saddle portions generally wrap around the intersecting members so as to frictionally engage them and hold them in position. Saddle member 66 may be positioned to engage first member 40. Corresponding portions of intersection clip 60 may be disposed within intersecting channels 41, disposed on first members 40, and 51, disposed on cross members 50 and 52.

[0041] Figs. 14a-16 illustrate various embodiments of the first member 40 that includes a keyed aperture 42. First members 40a, b, c, d each include at least one keyed aperture 42a, b, c, d, respectively. Each keyed aperture 42 a, b, c, d includes a major channel 46a, b, c, d and a secure channel 45a, b, c, d, respectively. As discussed above, an intersecting member is first disposed

in major channel 46 and then rotated so as to be locked in place in secure channel 45. As shown in Figs. 14a-16, first members 40a, b, c, d may be of various lengths and configurations. For example, first members 40a, b, c are straight, while first member 40d is curved. First member 40a includes a wedge-like key 46a, while first members 40b, c, d include block-like keys 46b, c, d, respectively. Key members 46a, b, c, d are configured to interconnect with key channels 48a, b, c, d, respectively, on adjacent members. First members 40a, b, c, d also include intersection channels 41a, b, c, d, respectively, aligned on the edges of the members adjacent the keyed apertures 42a, b, c, d. Intersection channels 41a, b, c, d provide seats for the saddle portions of intersecting clips 60 that are disposed therein when the support structure is assembled.

[0042] Figs. 17a-19 illustrate various embodiments of first cross members 50a, b, c, d. The illustrated embodiments also may be used as second cross members in a decorative structure of the present invention. Cross members 50a, b, c, d generally include key member 57a, b, c, d that interconnect with key channels 58a, b, c, d formed on adjacent members. As shown in Fig. 17b, key member 57a and key channel 58a may be wedge-like, whereas, illustrated in Figs. 17a, 18 and 19, key members 57b, c, d and key channels 58b, c, d are block-like.

[0043] Figs. 18 and 19 illustrate secure grooves 53c and d. Secure grooves 53c and d are spaced along the length of cross members 50 at predetermined locations where the cross member is to intersect with a first member having a keyed aperture. Opposed pairs of secured grooves 53 may be formed on either side of the cross members 50 so as to provide an interlocking relationship with the edges of secure channels 45 included in the keyed apertures 42 of first members 40 when the two members are interconnected. Figs. 18 and 19 illustrate embodiments of cross members 50 in which a cross member may extend through a keyed aperture 42 on a first member 40 so that an intersection is formed simply by the cross member 50 and the first member 40, in

contrast with support structure intersections that include a first member 40 and a first cross member 50 interconnected with a second cross member 52. Cross members 50a, b, c, d also include a key-end secure groove 59a, b, c, d formed adjacent to key member 57a, b, c, d. Key-end secure groove 59 generally performs the same function as secure groove 53 of interconnecting with the edges of secure channel 45 formed in keyed aperture 42.

[0044] Figs. 20 and 21 illustrate a pair of major end caps 80 and a pair of minor end caps 82, respectively. Both major and minor end caps 80 and 82 may be interconnected to a first member 40, a first cross member 50 or a second cross member 52 thereby forming the end portion of support structure 44. End caps 80 and 82 include key members 83 and 84, respectively and key channels 85 and 86, respectively. The end caps also include intersection channels 81 and 87 that may act as seats for intersection clips 60.

[0045] As discussed above the decorative structures of the present invention may include a variety of configurations and materials. The decorative structures may include single support structures and panels or pluralities of support structures and panels that are interconnected and suspended within a space. Furthermore, the decorative structure the present invention may be used in conjunction with a light source in order to illuminate the space in which the structure is suspended. The light may be intricately formed with the decorative structure, or be positioned adjacent the structure in order for the panel to act as a reflector, diffuser or shade for the light source. These and other modifications to the embodiments illustrated herein may well be made without departing from the spirit and scope of the present invention.